

4.4

Interactions among Living Things

Recall from Section 4.1 that a population is all the members of a particular species found in one area. Biological populations vary in size. They can be large, such as an ant colony (Figure 1), or small, such as a single pair of breeding woodpeckers in a woodlot (Figure 2).



Figure 1 The tens of thousands of ants that live in this ant nest are an example of a large population.

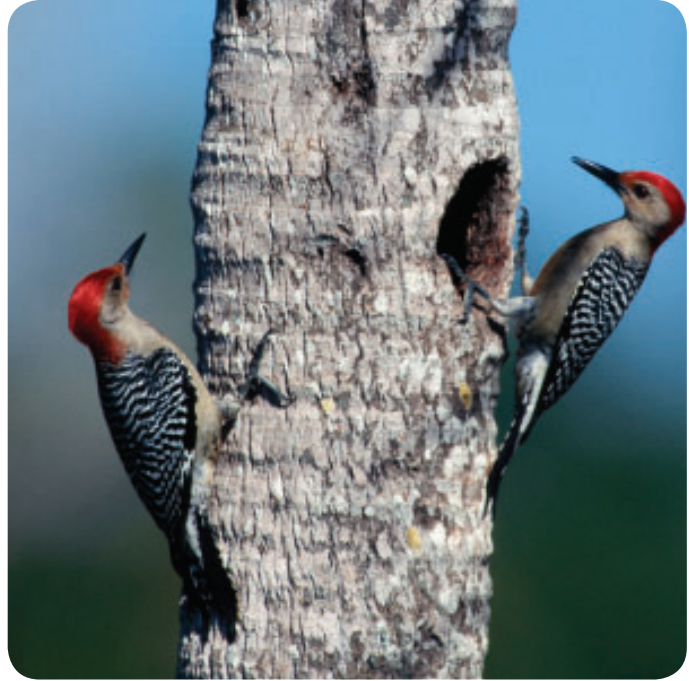


Figure 2 The two red-bellied woodpeckers shown here represent a small population.

TRY THIS: Counting Populations

SKILLS MENU: performing, observing, analyzing, communicating



The size of populations and number of populations in a specific area can vary greatly. In this activity, you will compare the size and number of plant populations on your school grounds.

Equipment and Materials: metre stick; plant identification guide (optional)

1. In groups of three or four, measure out an area of 1 m² on your school grounds where vegetation is growing. This will be your study plot. All of the class study plots should be close together and in the same general location.
2. Find three plant species growing on your plot. Draw a sketch of each of these plant species. If you know the names of your selected plants, record them on your drawings. Your teacher may provide you with identification guides to help you identify the plants.
3. For each species of plant, count the number of individuals on your plot. Record your totals.
4. Compare your findings with other groups. Use information from your classmates' drawings to fill in the names of any species that are missing from your own drawings.
5. Create a master list of plants and their populations for the total area (all study plots) covered by your class.
 - A. Which plant species in your plot had the largest population? Which plant species had the smallest population?
 - B. When you compared your findings with other groups, were there any plant species that were found on all or most of the study plots? If so, name them.
 - C. Were there any plants on your study plot that were not found on other study plots? If so, name them.
 - D. When all the study plots were compared, which plant species was the most common? How do you know this?
 - E. Which plant, or plants, was the least common over all the study plots?

Although ecosystems vary in size, there is a limit to the number of organisms an ecosystem can support. Abiotic factors limit the number of organisms that can live in an ecosystem. For example, if there is little water, then only a few plants can grow. How organisms interact within an ecosystem also limits the number of organisms in an ecosystem. Two important biotic interactions are competition and predation.

Competition

Competition is the struggle that happens when organisms in the same habitat try to use the same resources. For example, plants that grow close together in one area compete for the same water, sunlight, and nutrients (Figure 3). If these resources are limited, some plants may become small and thin, and some may die. This leaves more water, sunlight, and nutrients for the remaining plants, which survive and grow strong. Competition controls the population size by limiting the number of organisms that can survive on the resources in the area.

competition: occurs when more than one organism tries to obtain the same basic resources in the same habitat



Figure 3 All these plants are competing for the same resources.

Animals also compete for resources. A pond may only be able to provide enough food and water for a certain number of frogs. If too many frogs live in the same area and compete for resources, there will not be enough food and water. Some frogs will move to another area or some may die. Humans are an example of an organism that competes with other organisms for resources. When farmers grow crops, they spray pesticides on the crops to stop other organisms from eating them. Farmers are able to control, or even eliminate, competing organisms.

predator: an organism that hunts other living things for food

prey: an animal that is hunted by a predator



Figure 4 These wolves are feeding on a moose they have hunted.

Predation

An animal that hunts other animals for food is called a **predator**. The animal that is hunted by the predator is called the **prey**. A wolf (predator) eating a moose (prey) is an example of a predator-prey relationship (Figure 4). A moose eating grass is not an example of a predator-prey relationship because the moose does not need to hunt the grass.

The population of predators is affected by the population of prey and vice versa. The number of predators can only increase if there is enough food to eat. If a predator population is increasing in size, the prey population will decrease in size because more predators are eating prey. Hence, predators keep the number of prey from increasing. However, if the prey population gets too low, there is not enough for the predators to eat. The predator population decreases; some individuals die from starvation and others may be too weak to produce young. As the predator population decreases, the prey population increases because there are fewer predators hunting them. This results in an up-and-down pattern of predator and prey populations in a particular habitat over time (Figure 5).

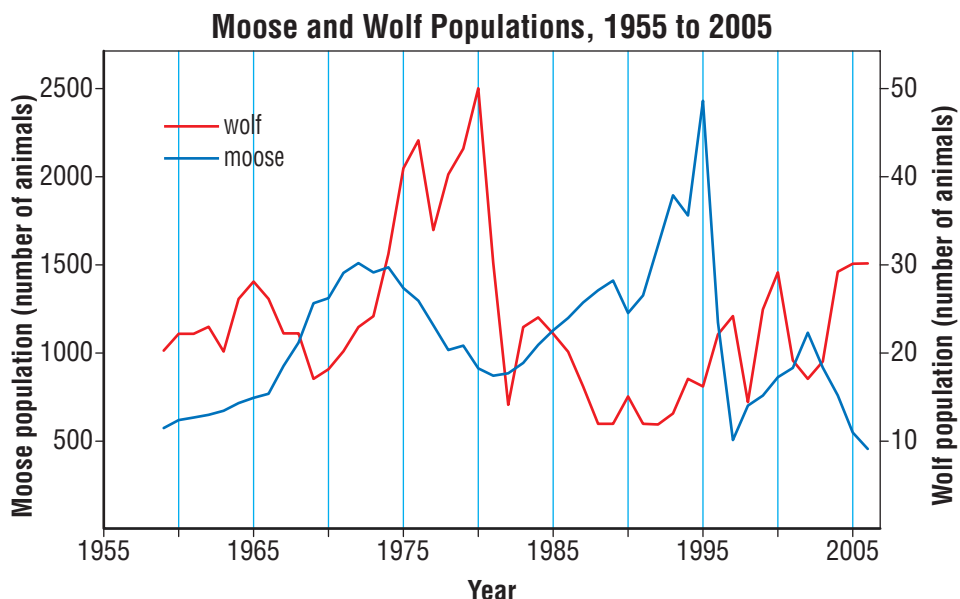


Figure 5 As the wolf population increased between 1970 and 1980, the moose population decreased in size. When the wolf population decreased in size, the moose population recovered.

The predator-prey cycle also affects plant populations. Most prey animals, such as moose and rabbits, feed on plants. When the prey population is large, the prey animals eat all of the available plants in the habitat. The plant population gets smaller, which can lead to starvation of the prey animals. Predators can now easily catch the weakened prey, which reduces the prey population. The plants then have a chance to recover because there are fewer prey animals eating them.

Mutualism

In competition and predation, one organism usually “wins” while another “loses.” However, there are some interactions between organisms in which both organisms “win.” **Mutualism** is an interaction between individuals of different species in which both individuals benefit. An example of mutualism can be seen when a bee visits a flower. The bee takes nectar from the flower for food, and picks up pollen from the flower while doing so. The pollen is then transferred to the next flower the bee visits. This transfer of pollen allows plants to reproduce. The nectar benefits the bee and the transfer of pollen benefits the flower. 🌍

Another example of mutualism occurs between plants of the legume family and bacteria in the soil. Peas, beans, peanuts, and other legumes have swellings on their roots (Figure 6). These swellings contain special bacteria. The bacteria provide the plants with nitrogen, and the plants provide the bacteria with several nutrients that the bacteria need to survive. Both the bacteria and the legume plants benefit from the interaction.



mutualism: an interaction between individuals of different species that benefits both individuals

To try an interactive pollination activity,

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Figure 6 The swellings on the roots of this field bean plant contain bacteria. The process by which bacteria provide plants with nitrogen is called “nitrogen fixation.” The bacteria that do this are called “nitrogen-fixing bacteria.”

Unit Task

The interactions among living things affect their ability to survive. How might this knowledge help you with the Unit Task?



CHECK YOUR LEARNING

1. In your own words, explain competition.
2. Explain how competition affects the number of organisms that can live in a habitat.
3. (a) Give an example of a predator.
(b) Give an example of a prey animal.
4. (a) Look at Figure 5. Describe what is happening to the wolf population and the moose population between 1985 and 1990.
(b) In your own words, explain why this is happening.